(wafer). As shown in FIG. 14B, Ar^+ laser of 514.5 nm are irradiated along the alignment portion the polymethyl siloxane film emits fluorescence. The position of the semiconductor substrate 1 (wafer) is obtained by measuring the portions at which fluorescence is emitted, thereby enabling alignment.

(Twelfth Embodiment)

FIGS. 9A to 9C are sectional views each showing the steps of manufacturing a semiconductor device according to a twelfth embodiment of the present invention. A step of manufacturing a semiconductor device according to the present embodiment is characterized by comprising the steps of: forming a second interlayer insulation film 204 on a semiconductor substrate 201; irradiating the interlayer insulation film 204 with the electron beam while applying a heating process to the second interlayer insulation film 204, thereby forming a modified layer 204b partly in the film thickness direction of the interlayer insulation film 204; and etching a surface of an interlayer insulation film 202 having the modified layer 204b formed thereon, thereby forming a wiring groove 205. The size of the semiconductor substrate 201 is 8 inches, for example.

In the present embodiment, as shown in FIGS. 9A to 9C, assume that a first interlayer insulation film (base insulation film) 202 is formed in advance on the

surface of the semiconductor substrate 201. The first interlayer insulation film 202 is obtained as a polymethyl siloxane film, for example. The first interlayer insulation film 202 is formed in a manner similar to a method for forming a second interlayer insulation film 204 described later. Further, assume that an embedded wire 203 essentially consisting of a copper (Cu) is formed in advance on the surface of the first interlayer insulation film 202.

In the present embodiment, as a second interlayer insulation film 204, a polymethyl siloxane film that is an insulation film with its low dielectric rate is formed on the first interlayer insulation film 202. The film thickness of the above polymethyl siloxane film is about 1 micron.

Hereinafter, the steps of forming the above polymethyl siloxane film will be described by dividing them into the steps 1 to 4.

Step 1:

A liquid-like raw material called a vanish (not shown) obtained by dissolving a film material or a polymethyl siloxane for a precursor of the film material is supplied on a first interlayer insulation film 202. As a method for disposing the above vanish, in the present embodiment, there is employed a coating technique capable of supplying a vanish uniformly with substantially uniform thickness so that a good quality

and uniform polymethyl siloxane film is formed. In the vanish coating work, specifically, a coater (not shown) is used as a coating device, for example, whereby a vanish is supplied on the surface of the first interlayer insulation film 202 by a spin coating technique which is one of the coating techniques.

Step 2:

A semiconductor substrate 201, as shown in FIG. 9B, is supplied on a hot plate 204 (heating device) having a temperature control mechanism at a posture at which the surface side having a vanish coated thereon is oriented upwardly. A heating device having a temperature control mechanism other than a hot plate 204 may be used.

Then, the temperature of the hot plate 204 is controlled so that the vanish temperature is held at about 80℃, the vanish is heated together with the semiconductor substrate 201 and the first interlayer insulation film 202, and this state is held for about one minute. In this manner, a first heating process is applied.

Step 3:

While the semiconductor substrate 201 is placed on the hot plate 204, the temperature of the hot plate 204 is controlled so that the vanish temperature is held at about 200℃. Then, the vanish is heated with the semiconductor substrate 202 and the first interlayer